

Appendix A

Compliance Forms

The following forms are included for use with the low-rise Residential Standards:

<i>CF-1R – Certificate of Compliance**</i>	<i>2 Pages</i>
<i>MF-1R – Mandatory Measures Checklist**</i>	<i>2 Pages</i>
<i>WS-1R – Thermal Mass Worksheet</i>	<i>1 Page</i>
<i>WS-2R – Interpolation, Weighted Average & Additions space holder - form deleted**</i>	<i>1 Page</i>
<i>WS-3R – Fenestration Worksheet**</i>	<i>1 Page</i>
<i>DHW-1 – Water Heating Worksheet*</i>	<i>1 Page</i>
<i>DHW-2A – Single Family w/Multiple Heaters*</i>	<i>1 Page</i>
<i>DHW-2B – Multi-Family Buildings*</i>	<i>1 Page</i>
<i>DHW-3 – Indirect & Large Storage Gas Water Heaters</i>	<i>1 Page</i>
<i>DHW-4 –Auxillary Inputs (Solar & Wood Boilers)</i>	<i>2 Pages</i>
<i>DHW-5 – Combined Hydronic Space and Water Heating</i>	<i>1 Page</i>
<i>Form 3R – Proposed Construction Assembly</i>	<i>1 Page</i>
<i>Form S – Solar Heat Gain Coefficient (SHGC) Worksheet**</i>	<i>2 Pages</i>
<i>CF-4R – Certificate of Field Verification & Diagnostic Testing**</i>	<i>4 Pages</i>
<i>CF-6R – Installation Certificate**</i>	<i>7 Pages</i>
<i>IC-1 – Insulation Certificate</i>	<i>1 Page</i>

** Substantially Changed.

* Minor Changes

Project Title _____

Date _____

Project Address _____

Documentation Author _____ Telephone _____

Compliance Method (Package or Computer) _____ Climate Zone _____

Building Permit # _____

Plan Check / Date _____

Field Check / Date _____

Enforcement Agency Use Only

GENERAL INFORMATIONTotal Conditioned Floor Area _____ ft² Average Ceiling Height: _____ ftConditioned Slab Floor Area _____ ft²Building Type: _____ Single Family _____ Addition
(check one or more) _____ Multi-Family _____ Existing-Plus-AdditionFront Orientation: _____ North / South / East / West / All Orientations
(input front orientation in degrees from True North and circle one)

Number of Stories _____

Number of Dwelling Units: _____

Floor Construction Type: _____ Slab/Raised Floor (circle one or both)

BUILDING SHELL INSULATION

Component Type	Frame Type wd = wood stl = steel	Cavity Insulation R-Value	Sheathing Insulation R-Value	Total R- Value ¹	Assembly U-Value ¹	Location/Comments (attic, garage, typical, etc.)
Wall						
Wall						
Roof						
Roof						
Floor						
Floor						
Slab Edge						

FENESTRATION**Shading Devices**

Fenestration #/Type/Pos.	Orien- tation	Area (ft ²)	Fenestration U-Value	Fenestration SHGC	Interior Shading Att. ²	Exterior Shading Att.	Overhangs /Fins
Front					Standard		
Front					Standard		
Left					Standard		
Left					Standard		
Rear					Standard		
Rear					Standard		
Right					Standard		
Right					Standard		
Skylight					Standard		
Skylight					Standard		

¹ For prescriptive compliance, Total R-Value and Assembly U-Value are not required for a wood-framed wall that meets cavity R-value insulation requirement for the Prescriptive Package.

² For prescriptive compliance, there are no credits for any interior shading except the default or "Standard" drapery. These default interior shading devices (draperies) need not be installed for compliance purposes.

Project Title _____

Date _____

HVAC SYSTEMS

Note: Input hydronic or combined hydronic data under Water Heating Systems, except Design Heating Load.

Heating Equipment Type (furnace, heat pump, etc.)	Minimum Efficiency (AFUE or HSPF)	Distribution Type and Location (ducts, attic, etc.)	Duct or Piping R-Value	Thermostat Type	Heat Pump Configuration (split or package)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
Cooling Equipment Type (air conditioner, heat pump, evap. cooling)	Minimum Efficiency (SEER)	Duct Location (attic, etc.)	Duct R-Value	Thermostat Type	Heat Pump Configuration (split or package)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

WATER HEATING SYSTEMS

Water Heater Type	Distribution Type	Number in System	Rated ¹ Input (kW or Btu/hr)	Tank Capacity (gallons)	Energy ¹ Factor or Recovery Efficiency	Standby ¹ Loss (%)	External Tank Insulation R-Value
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

1. For small gas storage water heaters (rated inputs of less than or equal to 75,000 Btu/hr), electric resistance, and heat pump water heaters, list Energy Factor. For large gas storage water heaters (rated input of greater than 75,000 Btu/hr), list Rated Input, Recovery Efficiency and Standby Loss. For instantaneous gas water heaters, list rated input and recovery efficiencies.

SPECIAL FEATURES and MODELING ASSUMPTIONS (Add extra sheets if necessary)**Including Thermal Mass** (thermal mass type, covering, thickness, and description)

COMPLIANCE STATEMENT

This certificate of compliance lists the building features and performance specifications needed to comply with Title 24, Parts 1 and 6 of the California Code of Regulations, and the administrative regulations to implement them. This certificate has been signed by the individual with overall design responsibility. When this certificate of compliance is submitted for a single building plan to be built in multiple orientations, any shading feature that is varied is indicated in the Special Features / Remarks section.

Designer or Owner (per Business and Professions Code)

Name: _____
Title/Firm: _____
Address: _____

Telephone: _____
Lic. #: _____

(signature)

(date)

Documentation Author

Name: _____
Title/Firm: _____
Address: _____

Telephone: _____

(signature)

(date)

Enforcement Agency

Name: _____
Title: _____
Agency: _____
Telephone: _____

(signature / stamp)

(date)

MANDATORY MEASURES CHECKLIST: RESIDENTIAL (Page 1 of 2) MF-1R

Note: Lowrise residential buildings subject to the Standards must contain these measures regardless of the compliance approach used. Items marked with an asterisk (*) may be superseded by more stringent compliance requirements listed on the Certificate of Compliance. When this checklist is incorporated into the permit documents, the features noted shall be considered by all parties as minimum component performance specifications for the mandatory measures whether they are shown elsewhere in the documents or on this checklist only.

Instructions: Check or initial applicable boxes when completed or enter N/A if not applicable.

DESCRIPTION	DESIGNER	ENFORCEMENT
Building Envelope Measures:		
* §150(a): Minimum R-19 ceiling insulation.		
§150(b): Loose fill insulation manufacturer's labeled R-Value.		
* §150(c): Minimum R-13 wall insulation in wood framed walls or equivalent U-value in metal frame walls (does not apply to exterior mass walls).		
* §150(d): Minimum R-13 raised floor insulation in framed floors.		
§150(l) : Slab edge insulation - water absorption rate no greater than 0.3%, water vapor transmission rate no greater than 2.0 perm/inch.		
§118: Insulation specified or installed meets insulation quality standards. Indicate type and form.		
§116-17: Fenestration Products, Exterior Doors, and Infiltration/Exfiltration Controls 1. Doors and windows between conditioned and unconditioned spaces designed to limit air leakage. 2. Fenestration products (except field-fabricated) have label with certified U-value, certified Solar Heat Gain Coefficient (SHGC), and infiltration certification. 3. Exterior doors and windows weatherstripped; all joints and penetrations caulked and sealed.		
§150(g): Vapor barriers mandatory in Climate Zones 14 and 16 only.		
§150(f): Special infiltration barrier installed to comply with § 151 meets Commission quality standards.		
§150(e): Installation of Fireplaces, Decorative Gas Appliances and Gas Logs. 1. Masonry and factory-built fireplaces have: a. Closeable metal or glass door b. Outside air intake with damper and control c. Flue damper and control 2. No continuous burning gas pilot lights allowed.		
Space Conditioning, Water Heating and Plumbing System Measures:		
§110-§113: HVAC equipment, water heaters, showerheads and faucets certified by the Commission.		
§150(h): Heating and/or cooling loads calculated in accordance with ASHRAE, SMACNA or ACCA.		
§150(i): Setback thermostat on all applicable heating and/or cooling systems.		
§150(j): Pipe and tank insulation 1. Storage gas water heaters rated with an Energy Factor less than 0.58 must be externally wrapped with insulation having an installed thermal resistance of R-12 or greater. 2. First 5 feet of pipes closest to water heater tank, non-recirculating systems, insulated (R-4 or greater) 3. Back-up tanks for solar system, unfired storage tanks, or other indirect hot water tanks have R-12 external insulation or R-16 combined internal/external insulation. 4. All buried or exposed piping insulated in recirculating sections of hot water systems. 5. Cooling system piping below 55° F insulated. 6. Piping insulated between heating source and indirect hot water tank.		

MANDATORY MEASURES CHECKLIST: RESIDENTIAL(Page 2 of 2) **MF-1R**

Note: Lowrise residential buildings subject to the Standards must contain these measures regardless of the compliance approach used. Items marked with an asterisk (*) may be superseded by more stringent compliance requirements listed on the Certificate of Compliance. When this checklist is incorporated into the permit documents, the features noted shall be considered by all parties as minimum component performance specifications for the mandatory measures whether they are shown elsewhere in the documents or on this checklist only.

Instructions: Check or initial applicable boxes when completed or enter N/A if not applicable.

DESCRIPTION	DESIGNER	ENFORCEMENT
Space Conditioning, Water Heating and Plumbing System Measures: (continued)		
<p>* §150(m): Ducts and Fans</p> <ol style="list-style-type: none">1. All ducts and plenums constructed, installed, insulated, fastened, and sealed to comply with the ICBO 1997 UMC sections 601 and 603; ducts insulated to a minimum installed R-4.2 or ducts enclosed entirely within conditioned space. Openings shall be sealed with mastic, tape, aerosol sealant or other duct closure system that meets the applicable requirements of UL181, UL181A, or UL181B and other applicable specified tests for longevity given in §150(m)..2. Exhaust fan systems have back draft or automatic dampers.3. Gravity ventilating systems serving conditioned space have either automatic or readily accessible, manually operated dampers.		
<p>§114: Pool and Spa Heating Systems and Equipment.</p> <ol style="list-style-type: none">1. System is certified with 78% thermal efficiency, on-off switch, weatherproof operating instructions, no electric resistance heating and no pilot light.2. System is installed with:<ol style="list-style-type: none">a. At least 36" of pipe between filter and heater for future solar heating.b. Cover for outdoor pools or outdoor spas.3. Pool system has directional inlets and a circulation pump time switch.		
<p>§115: Gas fired central furnaces, pool heaters, spa heaters or household cooking appliances have no continuously burning pilot light. (Exception: Non-electrical cooking appliances with pilot < 150 Btu/hr)</p>		
Lighting Measures:		
<p>§150(k)1.: Luminaires for general lighting in kitchens shall have lamps with an efficacy of 40 lumens/watt or greater for general lighting in kitchens. This general lighting shall be controlled by a switch on a readily accessible lighting control panel at an entrance to the kitchen.</p>		
<p>§150(k)2.: Rooms with a shower or bathtub must either have at least one luminaire with lamps with an efficacy of 40 lumens/watt or greater switched at the entrance to the room or one of the alternatives to this requirement allowed in §150(k)2.; and recessed ceiling fixtures are IC (insulation cover) approved.</p>		

FORM WS-2R

INTERPOLATION, WEIGHTED AVERAGE & ADDITIONS

is no longer valid and has intentionally been deleted from the
July 1, 1999 edition of the Residential Manual

WATER HEATING WORKSHEET

DHW-1

Project Title _____

Date _____

No. of Different Water Heater Types: _____

Total No. of Water Heaters: _____

Conditioned Floor Area (CFA): _____ ft²

Notes: For single family dwellings with multiple water heaters, also submit DHW-2A. For multi-family buildings, also submit DHW-2B.

Heater Type # _____ Data**A. Water Heater Type** (check one)

- ☐ Storage Gas
- ☐ Large Storage Gas
- ☐ Storage Electric
- ☐ Storage Heat Pump
- ☐ Instantaneous Gas
- ☐ Instantaneous Electric
- ☐ Indirect Gas

B. Manufacturer _____**C. Model No.** _____**D. Energy Factor** _____**E. Gallons** _____**F. Pilot Btu/hr** _____**G. Thermal Eff.** _____**H. Auxiliary Input** (check one or both)

- ☐ Wood Stove
- ☐ Solar, Active or Passive

I. Distribution System (check one)

- ☐ Standard
- ☐ Hot Water Recovery (HWR)
- ☐ Point of Use (POU)
- ☐ Pipe Insulation (PI)
- ☐ Recirculation: No Control
- ☐ Recirculation: Timer
- ☐ Recirculation: Temp.
- ☐ Recirculation: Time/Temp.
- ☐ Recirculation: Demand
- ☐ HWR + Recirculation: Demand
- ☐ PI + Recirculation: Demand

Energy Use Calculation

- 1a. Standard Recovery Load _____
(from Table 6-5 or DHW 2a or 2b)
- 1b. Distribution Credit/Penalty _____
(from Table 6-6)
- 1c. Solar Energy Credit _____
(from DHW-4)
- 1d. Adjusted Recovery Load _____
(1a - 1b - 1c)
- 2a. Basic Energy Use _____
(from Table 6-7)
- 2b. Wood Stove Boiler Credit _____
(from DHW-4)
- 2c. **Proposed Energy Use**
(2a - 2b)
- 3. **Standard Energy Use**
(from Table 6-5)

Heater Type # _____ Data**A. Water Heater Type** (check one)

- ☐ Storage Gas
- ☐ Large Storage Gas
- ☐ Storage Electric
- ☐ Storage Heat Pump
- ☐ Instantaneous Gas
- ☐ Instantaneous Electric
- ☐ Indirect Gas

B. Manufacturer _____**C. Model No.** _____**D. Energy Factor** _____**E. Gallons** _____**F. Pilot Btu/hr** _____**G. Thermal Eff.** _____**H. Auxiliary Input** (check one or both)

- ☐ Wood Stove
- ☐ Solar, Active or Passive

I. Distribution System (check one)

- ☐ Standard
- ☐ Hot Water Recovery (HWR)
- ☐ Point of Use (POU)
- ☐ Pipe Insulation (PI)
- ☐ Recirculation: No Control
- ☐ Recirculation: Timer
- ☐ Recirculation: Temp.
- ☐ Recirculation: Time/Temp.
- ☐ Recirculation: Demand
- ☐ HWR + Recirculation: Demand
- ☐ PI + Recirculation: Demand

Energy Use Calculation

- 1a. Standard Recovery Load _____
(from Table 6-5 or DHW 2a or 2b)
- 1b. Distribution Credit/Penalty _____
(from Table 6-6)
- 1c. Solar Energy Credit _____
(from DHW-4)
- 1d. Adjusted Recovery Load _____
(1a - 1b - 1c)
- 2a. Basic Energy Use _____
(from Table 6-7)
- 2b. Wood Stove Boiler Credit _____
(from DHW-4)
- 2c. **Proposed Energy Use**
(2a - 2b)
- 3. **Standard Energy Use**
(from Table 6-5)

Heater Type # _____ Data**A. Water Heater Type** (check one)

- ☐ Storage Gas
- ☐ Large Storage Gas
- ☐ Storage Electric
- ☐ Storage Heat Pump
- ☐ Instantaneous Gas
- ☐ Instantaneous Electric
- ☐ Indirect Gas

B. Manufacturer _____**C. Model No.** _____**D. Energy Factor** _____**E. Gallons** _____**F. Pilot Btu/hr** _____**G. Thermal Eff.** _____**H. Auxiliary Input** (check one or both)

- ☐ Wood Stove
- ☐ Solar, Active or Passive

I. Distribution System (check one)

- ☐ Standard
- ☐ Hot Water Recovery (HWR)
- ☐ Point of Use (POU)
- ☐ Pipe Insulation (PI)
- ☐ Recirculation: No Control
- ☐ Recirculation: Timer
- ☐ Recirculation: Temp.
- ☐ Recirculation: Time/Temp.
- ☐ Recirculation: Demand
- ☐ HWR + Recirculation: Demand
- ☐ PI + Recirculation: Demand

Energy Use Calculation

- 1a. Standard Recovery Load _____
(from Table 6-5 or DHW 2a or 2b)
- 1b. Distribution Credit/Penalty _____
(from Table 6-6)
- 1c. Solar Energy Credit _____
(from DHW-4)
- 1d. Adjusted Recovery Load _____
(1a - 1b - 1c)
- 2a. Basic Energy Use _____
(from Table 6-7)
- 2b. Wood Stove Boiler Credit _____
(from DHW-4)
- 2c. **Proposed Energy Use**
(2a - 2b)
- 3. **Standard Energy Use**
(from Table 6-5)

4. **For Prescriptive Compliance** (one water heater per dwelling): Line 2c must not exceed Line 3

Project Title _____

Date _____

Note: In addition to this form, a DHW-1 Water Heating Worksheet must also be submitted to document water heater type(s).

Single Family Project Data

1. No. of different water heater types: _____
 2. Total conditioned floor area: _____ ft²
- | | No. of Heaters | Heater Type # | Manufacturer & Model No. |
|-----|----------------|---------------|--------------------------|
| 3a. | _____ | #1 | _____ |
| 3b. | _____ | #2 | _____ |
| 3c. | _____ | #3 | _____ |
4. _____ Total Number of Water Heaters
 5. Standard Recovery Load: _____ from Table 6-5 based on line 2
 6. Recovery Load Per Heater: _____ (line 5 ÷ line 4); enter on DHW-1, line 1a for each Heater Type, and complete calculation through line 2c.
 7. Proposed Energy Use, Heater #1: _____ (from DHW-1 line 2c, Heater #1) × (line 3a)
 8. Proposed Energy Use, Heater #2: _____ (from DHW-1 line 2c, Heater #2) × (line 3b)
 9. Proposed Energy Use, Heater #3: _____ (from DHW-1 line 2c, Heater #3) × (line 3c)
 10. Total Proposed Energy Use: _____ (line 7 + line 8 + line 9)
 11. Standard Energy Use: _____ from Table 6-5 based on line 2

Compliance

12. **Prescriptive Compliance:** Line 10 must be equal to or less than line 11.
See Part 6.1 and Chapter 3 in the *Residential Manual* for details.

Project Title _____

Date _____

Notes: In addition to this form, a DHW-1 Water Heating Worksheet must also be submitted to document water heating type(s). If the calculation (line 4) is by "Individual Dwelling Unit" and system configuration (line 5) is "Individual Heaters," no additional information need be entered on this sheet.

Multi-Family Project Data

1. Number of dwelling units: _____
2. Total conditioned floor area: _____ ft²
3. Average floor area: _____ (Line 2/Line 1)
4. Calculation by (check one):
 _____ Average Dwelling Unit
 _____ Individual Dwelling Unit
5. System configuration (check one):
 _____ Individual Heaters (one per dwelling unit)
 _____ Shared Heaters (multiple dwelling units per heater)

Analysis by Average Dwelling Unit

One Individual Heater Per Dwelling Unit				Gallons		Energy Factor		Thermal Efficiency	
No. of Heaters	Heater Type#	Manufacturer and Model#		Each	Total ¹	Each	Total ²	Each	Total ³
6a =	_____	_____			_____		_____		_____
6b =	_____	_____			_____		_____		_____
6c =	_____	_____			_____		_____		_____
Total	_____ = 7a			Total	_____ = 7b	Total	_____ = 7c	Total	_____ = 7d
				Ave.	_____ = 8a	Ave.	_____ = 8b	Ave.	_____ = 8c
					(7b/7a)		(7c/7a)		(7d/7a)

Individual Heaters

- 9a. Enter value 8a on DHW-1 Line E.
- 10a. Enter value 8b on DHW-1 Line D.
- 11a. Enter value 8c on DHW-1 line G.
- 12a. Check compliance on DHW-1 for average dwelling unit and average water heating.

Shared Heater(s)

- 9b. Average unit Adjusted Recovery Load: _____ From DHW-1, Line 1d
- 10b. Total Adjusted Recovery Load: _____ (Line 1) × (Line 9b)
- 11b. Total Basic Energy Use: _____ From Table 6-7, or DHW-3
- 12b. Average Unit Basic Energy Use: _____ (Line 11b) ÷ (Line 1): enter on Line 2a, DHW-1
- 13b. Check average unit compliance on DHW-1.

Compliance

14. **Prescriptive Compliance** (for individual or shared heaters):
 DHW-1 Line 2c must be equal to or less than DHW-1 Line 3.
 See Part 6.1 and Chapter 3 in the *Residential Manual* for details.

¹ Total Gallons = (No. of Heaters) x (Gallons for each heater of this Heater Number)
² Total Energy Factor = (No. of Heaters) x (Energy Factor for each heater of this Heater Number)
³ Total Thermal Efficiency = (No. of Heaters) x (Thermal Efficiency for each heater of this Heater Number)

Project Title _____

Date _____

Note: This sheet must also be submitted with a DHW-1 water heating worksheet, as well as a DHW-2B form with large storage gas heaters in multi-family buildings.

Indirect Gas Water Heaters

1. Storage tank Manufacturer/Model No. _____
2. Boiler and Instantaneous Heater Manufacturer/Model No. _____
3. Storage tank insulation R-value: Tank _____ External _____ Total _____
4. Storage tank volume (gallons) _____
5. Boiler AFUE or Instantaneous Water Heater Thermal (Recovery) Efficiency EFF _____
6. Adjusted Recovery Load (MBtu/yr, from Line 1d, DHW-1) ARL _____
7. Jacket loss (MBtu/yr, from Table 6-7E) JL _____
8. Pilot Energy (Btuh, from appliance database, or use 800) PE _____
9. Basic Energy Use (BEU) = $(\text{ARL} + \text{JL}) \div (0.98 \times \text{EFF}) + (\text{PE} \times 0.00876)$
(Enter BEU on DHW-1, Line 2a or on DHW-2B, Line 11b) BEU _____

Large Storage Gas Heaters (> 75,000 Btuh input)

1. Water Heater Manufacturer _____
2. Water Heater Model No. _____
3. Storage Tank Volume (gallons) VOL= _____
4. Water Heater Thermal (Recovery) Efficiency (decimal fraction) EFF _____
5. Adjusted Recovery Load (Mbtu/yr, from Line 1d, DHW-1 or Line 10b, DHW-2B) ARL _____
6. Standby Loss % (from appliance database - e.g., "2.7") SBL% _____
7. Basic Energy Use (BEU) = $[\text{ARL}/\text{EFF} + (5.461 \times \text{SBL} \times \text{VOL})/100]$
(Enter BEU on DHW-1, Line 2a or on DHW-2B, Line 11b) BEU _____

Project Title _____

Date _____

Notes: This sheet must also be submitted with a DHW-1 water heating worksheet. Detailed instructions for calculating Active Solar Credit, Passive Solar Credit or Wood Stove Boiler Credit are contained in Section 6.3 of the *Residential Manual*.

Active Solar Credit

1. Solar Energy Credit =
(Solar Fraction) \times (line 1a - line 1b, from DHW-1) \times (0.80) = _____

Active Solar Credit Notes: In equation 1, Solar Fraction = "FDHW" from F-Chart.
F-Chart parameters are fixed as listed in Table 6-8. Enter Line 1 on DHW-1, Line 1c.

Passive Solar Credit

2. Calculate temperature difference from SRCC data:

$$T_{\text{SRCC}} = \frac{[Q_{\text{SAV}} / (100 \text{ gal/day} \times 8.25 \text{ Btu/gal-}^\circ\text{F})] + [Q_{\text{CAP}} / (V_t \times 8.25 \text{ Btu/gal-}^\circ\text{F})]}{1} = \underline{\hspace{2cm}}$$

Where: Q_{SAV} (Btu/day) = from SRCC test results
 Q_{CAP} (Btu) = from SRCC test results
 V_t (gal) = total volume of solar storage tank

3. Calculate energy losses during SRCC test:

$$Q_{\text{LOSS,SRCC}} = T_{\text{SRCC}} \times 16 \text{ hr/day} \times L \text{ Btu/hr-}^\circ\text{F} = \underline{\hspace{2cm}}$$

Where: 16 = number of hours system is losing heat
L (Heat Loss Coefficient, Btu/hr- $^\circ\text{F}$ from SRCC test results)

4. Calculate energy collected during the SRCC test:

$$Q_{\text{TOTAL,SRCC}} = Q_{\text{SAV}} + Q_{\text{LOSS,SRCC}} = \underline{\hspace{2cm}}$$

5. Adjust energy collected to climate zone insolation values (see Table 6-9)

$$Q_{\text{TOTAL,LOCAL}} = 1204 + [(Q_{\text{TOTAL,SRCC}} - 1204) / 1500] \times \text{CZ insolation} = \underline{\hspace{2cm}}$$

6. Determine $T_{\text{TANK,LOCAL}}$, average tank temperature delivered to the site:

$$T_{\text{TANK,LOCAL}} = (A_1 + A_2 + Q_{\text{TOTAL,LOCAL}}) / (A_3 + A_4) = \underline{\hspace{2cm}}$$

Where: A_1 = (50 gal/day) \times (8.25 Btu/gal- $^\circ\text{F}$) \times (CZ Water Main Temp)
 A_2 = 16 hrs/day \times L \times (CZ Ambient Air Temp)
 A_3 = (50 gal/day) \times (8.25 Btu/gal- $^\circ\text{F}$)
 A_4 = 16 hrs/day \times L
CZ Water Main Temp and CZ Ambient Air Temp from Table 6-10

7. Determine energy losses at the site:

$$Q_{\text{LOSS,LOCAL}} = L \times 16 \text{ hrs} \times (T_{\text{TANK,LOCAL}} - \text{CZ Ambient Air Temp}) = \underline{\hspace{2cm}}$$

Project Title _____

Date _____

Notes: This sheet must also be submitted with a DHW-1 water heating worksheet. Detailed instructions for calculating Active Solar Credit, Passive Solar Credit or Wood Stove Boiler Credit are contained in Section 6.3 of the *Residential Manual*.

Passive Solar Credit (cont.)

8. Determine energy used by electric resistance freeze protection devices:

$$\text{ERP} = (\text{Freeze days/yr} + 4) \times (\text{Collector Area}) \times (0.5 \text{ kBtu /ft}^2 \text{ -freeze day}) = \underline{\hspace{2cm}}$$

This is calculated only if the system uses electric resistance freeze protection.

9. Calculate system total annual energy contribution (mmBtu/yr); Enter on DHW-1, Line 1c:

$$\{(\text{Q}_{\text{TOTAL, LOCAL}} - \text{Q}_{\text{LOSS, LOCAL}}) \times 0.365 - \text{ERP}\} \times 0.001 \times (\text{No. of Dwelling Units}) = \underline{\hspace{2cm}}$$

The credit calculated cannot exceed the larger of DHW-1, Line 1a - Line 1b or 3 mmBtu/yr.

Wood Stove Boiler Credit

10. Wood Stove Boiler Credit:

$$\begin{array}{l} \text{(Basic Energy Use)} \\ \text{DHW-1, Line 2a} \end{array} \times \begin{array}{l} \text{(Credit Factor)} \\ \text{From Table 6-12} \end{array} = \underline{\hspace{2cm}}$$

Table 1: Energy Used by Freeze Protection Devices

Climate Zone	Freeze Degree Hours ¹	Climate Zone	Freeze Degree Hours ¹
1	44	9	1
2	624	10	57
3	3	11	417
4	157	12	324
5	74	13	195
6	0	14	2813
7	0	15	28
8	1	16	8152-26153 ²

1. Freeze Degree Hours is defined as the annual sum-mation of hours that dry bulb temperature is less than or equal to 34° F from midnight to 10 am and from 6 pm to midnight.
2. The lower limit is for Mt. Shasta (3535' elevation) and the upper limit is for Tahoe City (6,230' elevation).

NOTE: Data in this table is used in item 8 of DWH-4 (Part 2 of 2).

Project Title _____

Date _____

Storage Gas

1. Recovery Efficiency/AFUE _____ unitless From manufacturer's literature or appliance database
2. Average Hourly Pipe Heat Loss _____ kBtu/hr From Pipe Heat Loss Worksheet below, line 8
3. Rated Input _____ kBtu/hr From manufacturer's literature or appliance database
4. Effective AFUE _____ unitless Line 1 - (Line 2 ÷ Line 3)

Storage Electric

1. Average Hourly Pipe Heat Loss _____ kBtu/hr From Pipe Heat Loss Worksheet below, line 8
2. Rated Input _____ kW From manufacturer's literature or appliance database
3. Pump Watts _____ watt From manufacturers literature
4. Term A _____ unitless $1 - [\text{Line 1} \div (3.413 \times \text{Line 2})]$
5. Term B _____ unitless $1 + [\text{Line 3} \div (1000 \times \text{Line 2})]$
6. Effective HSPF (no fan) _____ Btu/watt $3.413 \times (\text{Line 4} \div \text{Line 5})$
7. Effective HSPF (with fan) _____ Btu/watt $1.017 \div [(1 \div \text{Line 6}) + 0.005]$

Heat Pump

1. Energy Factor _____ unitless From manufacturer's literature or appliance database
2. Average Hourly Pipe Heat Loss _____ kBtu/hr From Pipe Heat Loss Worksheet below, line 8
3. Rated Input _____ kW From manufacturer's literature or appliance database
4. Recovery Efficiency _____ unitless $1 \div [(1 \div \text{Line 1}) - 0.1175]$
5. Climate Zone Adjustment _____ unitless From table below
6. Effective HSPF (no fan) _____ Btu/watt $3.413 \times [(\text{Line 4} \div \text{Line 5}) - \text{Line 2} \div (3.413 \times \text{Line 3})]$
7. Effective HSPF (with fan) _____ Btu/watt $1.017 \div [(1 \div \text{Line 6}) + 0.005]$

Climate Zone Adjustment

Climate Zone	Adjustment
1, 14	1.04
2, 3	0.99
4, 5, 12	1.07
6-11, 13, 15	0.92
16	1.50

Pipe Heat Loss Rate Table

Pipe Nominal Diameter (inches)	Insulation Thickness (inches)		
	0.5	0.75	1.0
0.50	71.6	60.9	54.2
0.75	91.1	75.8	66.6
1.00	109.9	90.1	78.8
1.50	146.7	117.5	100.3
2.00	182.9	144.3	121.7

Pipe Heat Loss Worksheet

(Complete this section when more than 10 feet of pipe is in unconditioned space.)

1. Description of Pipe Size and Insulation Condition	2. Pipe Heat Loss Rate (kBtu/yr·ft) ¹	3. Pipe Length (ft)	4. Total Pipe Heat Loss	Average Hourly Pipe Heat Loss (kBtu/hr)
_____	_____	× _____	= _____	
_____	_____	× _____	= _____	
_____	_____	× _____	= _____	
_____	_____	× _____	= _____	
_____	_____	× _____	= _____	
8. Average Hourly Pipe Loss = (line 8b/8760) = _____				

1. From Pipe Heat Loss Rate Table.

PROPOSED CONSTRUCTION ASSEMBLY: RESIDENTIAL FORM 3R

Project Title

Project Address

Documentation Author

Telephone

Assembly Name

Date

Building Permit #

Plan Check / Date

Field Check / Date

Enforcement Agency Use Only

Sketch of Proposed Construction Assembly

Assembly Type:

(check one)

☐ Floor
☐ Wall
☐ Ceiling/Roof

Framing Material:

Framing Size:

_____ × _____

Framing Spacing:

_____ inches on center (" o.c.)

Framing Percentage (Fr.%):

(check one)

Wall: ☐ 15% (16" o.c.)
☐ 12% (24" o.c.)
☐ 9% (48" o.c.)
Floor/Ceiling: ☐ 10% (16" o.c.)
☐ 7% (24" o.c.)
☐ 4% (48" o.c.)

Wall Weight / sf:

(Packages only)

List of Construction Components

- Outside Surface Air Film
1. _____
 2. _____
 3. _____
 4. _____
 5. _____
 6. _____
 7. _____
 8. _____

Inside Surface Air Film

Total Unadjusted R-Values:

R-Value	
Cavity (R_c)	Frame (R_f)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
R_c	R_f

Framing Adjustment Calculation:

$$\left[\left(\frac{\quad}{1 + R_c} \right) \times \left(\frac{\quad}{1 - (\text{Fr.\%} \div 100)} \right) \right] + \left[\left(\frac{\quad}{1 + R_f} \right) \times \left(\frac{\quad}{\text{Fr.\%} \div 100} \right) \right] = \text{Total U-Value}$$
$$\frac{\quad}{1 \div \text{Total U-Value}} = \text{Total R-Value}$$

Items 1 through 4 must be completed for glazing/shading combinations by using the Default Table for Fenestration Products (Table S-1) ; documented manufacturer's data for labeled fenestration products, or Solar Heat Gain Coefficients Used for Exterior Shading Attachments (Table S-2) for the specific conditions indicated (#1a or #1b or #3). For instructions on filling out the worksheet, see *Shading* in the *RM Glossary, Appendix G*.

General Information

1a. For Fenestration Products w/NFRC testing and labels:

SHGC_{fen} = _____

OR

1b. For Fenestration Products without NFRC testing and labels (Table S-1):

SHGC_{fen} = _____

1c. Frame Type

1d. Product Type

1e. Glazing Type

1f. Single/Double Pane

metal, non-metal,
metal w/thermal break

operable/fixed

(visibly) tinted
uncoated (not visibly tinted)

single pane/double pane

2. Skylight

(Y/N) _____

("Skylights" must be mounted on a surface of pitch less than or equal to 1 in 12 for prescriptive compliance)

Combined Exterior Shade with Fenestration

Exterior Shade Type: _____

3. SHGC_{Exterior Shade}: _____

(If no exterior shade, assume standard bug screens, SHGC_{Exterior Shade} = 0.76 for ordinary windows.

This requirement does not apply to skylights where SHGC_{Exterior Shade} is assumed to be 1.00. If another exterior shade is substituted for bug screens, use one of the values from Table S-2

$$4. \left[\left(\frac{\text{SHGC}_{max}}{\text{SHGC}_{min}} \times 0.2875 \right) + 0.75 \right] \times \text{SHGC}_{min} = \text{SHGC}_{\text{Shade Open}}$$

Where:

SHGC_{max} = Larger of (#1a or #1b) or #3

SHGC_{min} = Smaller of (#1a or #1b) or #3

Note: Calculated Shading Coefficient values for SHGC shade open may be used directly for prescriptive packages.

Target Value for SHGC shade open is 0.39 for Package Requirement of SHGC_{fen} = 0.40.

TABLES

Table S-1: DEFAULT FENESTRATION SOLAR HEAT GAIN COEFFICIENT

Frame Type	Product	Glazing	Total Window SHGC	
			Single Pane	Double Pane
Metal	Operable	Uncoated	0.80	0.70
Metal	Fixed	Uncoated	0.83	0.73
Metal	Operable	Tinted	0.67	0.59
Metal	Fixed	Tinted	0.68	0.60
Metal, Thermal Break	Operable	Uncoated	0.72	0.63
Metal, Thermal Break	Fixed	Uncoated	0.78	0.69
Metal, Thermal Break	Operable	Tinted	0.60	0.53
Metal, Thermal Break	Fixed	Tinted	0.65	0.57
Non-Metal	Operable	Uncoated	0.74	0.65
Non-Metal	Fixed	Uncoated	0.76	0.67
Non-Metal	Operable	Tinted	0.60	0.53
Non-Metal	Fixed	Tinted	0.63	0.55

SHGC = Solar Heat Gain Coefficient

TABLES (Continued)

Table S-2: Solar Heat Gain Coefficients Used for Exterior Shading Attachments for Form S and Computer Performance Methods^{1,2}

Exterior Shading Device³	w/Single Pane Clear Glass & Metal Framing⁴
1) Standard Bug Screens	0.76
2) Exterior Sunscreens with weave 53*16/inch	0.30
3) Louvered Sunscreens w/louvers as wide as openings	0.27
4) Low Sun Angle (LSA) Louvered Sunscreens	0.13
5) Roll-down Awning	0.13
6) Roll Down Blinds or Slats	0.13
7) None (for skylights only)	1.00

1. These values may be used on line 9 of the Solar Heat Gain Coefficient (SHGC) Worksheet (form S) to calculate exterior shading with other glazing types and combined interior and exterior shading with glazing.
2. Exterior operable awnings (canvas, plastic or metal), except those that roll vertically down and cover the entire window, should be treated as overhangs for purposes of compliance with the Standards.
3. Standard bug screens must be assumed for all fenestration unless replaced by other exterior shading attachments. The solar heat gain coefficient listed for bug screens is an area-weighted value that assumes that the screens are only on operable windows. The solar heat gain coefficient of any other exterior shade screens applied only to some window areas must be area-weighted with the solar heat gain coefficient of standard bug screens for all other glazing (see Weighted Averaging in the Glossary). Different shading conditions may also be modeled explicitly in the computer performance method.

Project Title		Date
Project Address		Builder Name
Builder Contact	Telephone	Plan Number
HERS Rater	Telephone	Sample Group Number
HERS Provider	Telephone	Sample House Number

HERS RATER COMPLIANCE STATEMENT

The house was: ☐ Tested ☐ Approved as part of sample testing, but was not tested

As the HERS rater providing diagnostic testing and field verification, I certify that:

- ☐ CF-1R & CF-6R Compliance Documentation provided by Builder.
☐ The following requirements for compliance credit were met.

MINIMUM REQUIREMENTS FOR DUCT EFFICIENCY COMPLIANCE CREDIT

- ☐ Distribution system is fully ducted (i.e., does not use building cavities as plenums or platform returns in lieu of ducts)
☐ Where cloth backed, rubber adhesive duct tape is installed, mastic and drawbands are used in combination with cloth backed, rubber adhesive duct tape to seal leaks at duct connections.

Duct Diagnostic Testing Results

	Required for Compliance	Measured by Installer and documented on CF-6R	Measured by Rater
Duct Pressurization Test Results (CFM @ 25 Pa) as required from CF-1R			
Duct System Fan Flow Results (CFM) as required from CF-6R			

Field Verification Results

1. ☐ Yes ☐ No –ACCA Manual D Design was used for compliance (CF-1R) If yes is checked, fill out line 1a through 1c and line 2, otherwise go to line 3
- 1a. ☐ Yes ☐ No –Verify ACCA Manual D Design Calculations match plans and
- 1b. ☐ Yes ☐ No –Duct Layout on the plans – duct sizes, lengths, and register air flows and
- 1c. ☐ Yes ☐ No –Actual distribution is consistent with the design (including duct runs no longer than design, ducts not constricted or compressed, duct sizes and insulation values match design), and either
- 1c1 _____ Tested system fan flow (see above results) is not less than design¹, or
- 1c2 _____ Thermostatic expansion valve and removable access panel on the cooling coil is installed
2. ☐ Yes ☐ No –ACCA Manual D Design requirements have been met (rater has verified Yes for item 1 and has checked that either 1c1 or 1c2 is true.

¹ Measurement system is required to have an accuracy of $\pm 5\%$ of reading or ± 5 CFM, whichever is greater. Measurement comparisons must be within this tolerance.

Project Title	Plan Number	Date
Sample Group Number	Sample House Number	

3. ☐ Yes ☐ No –Were Ducts Located in Conditioned Space used for compliance (CF-1R)? If Yes, verify and check either 3a or 3b to identify which alternative was used for compliance, otherwise go to line 5.
 3a _____ Less than 12 feet of duct and air handler plenum length is installed in unconditioned space, or
 3b _____ 100% of duct (including air handler plenum) is installed in conditioned space. (Combustion equipment must be sealed from conditioned space).
4. ☐ Yes ☐ No –Requirements for ducts inside of conditioned space have been met (Rater has verified Yes for items 3 and has checked that either 3a or 3b is true).
5. ☐ Yes ☐ No –Was reduced Duct Surface Area in Unconditioned Locations used for compliance (CF-1R)? If Yes, document the areas used for compliance in the second column and the actual areas installed in the last column of the following table.

Measured duct exterior surface area in the following unconditioned duct locations (square feet):

	Maximum allowed for Compliance (from CF-1R)	Actual (Measured outside surface area calculated from measured outside perimeter and lengths)
Attics	_____	_____
Crawlspaces	_____	_____
Basements	_____	_____
Other (e.g., garages, etc.)	_____	_____

6. ☐ Yes ☐ No –Requirements for reduced duct surface area have been met (Rater has verified Yes for line 5, Yes for line 2 and has checked that the values in the last column of the above table are no greater than the values in the second column.)

MINIMUM REQUIREMENTS FOR INFILTRATION REDUCTION COMPLIANCE CREDIT

the following requirements for compliance credit were met

1. ☐ Yes ☐ No –This building obtained compliance credit for envelope infiltration reduction. If Yes, fill in the values for the following table, otherwise leave the remainder of this infiltration form blank.

Diagnostic Testing Results

2. ☐ Yes ☐ No –CF-6R shows results of builder testing. If Yes, fill in the test values in the table below. (No indicates failure of builder to provide information required to determine compliance.)

	Needed for Compliance (from CF-1R)	Builder Compliance Results (from CF-6R)	Blowerdoor Test Results Measured by Rater
Building Envelope Leakage (CFM @ 50 Pa)	_____	_____	_____
Infiltration level (CFM @ 50 Pa) equivalent to an SLA of 3.0 from CF-1R	_____	_____	_____
Minimum Building Infiltration (CFM @ 50 Pa) equivalent to an SLA of 1.5 from CF-1R	_____	_____	_____

Project Title	Plan Number	Date
Sample Group Number	Sample House Number	

Field Verification Results

- 2a. ☐ Yes ☐ No –Is measured infiltration less than the infiltration level used to determine compliance? (No indicates failure to meet infiltration level used for determining compliance)
- 2b. ☐ Yes ☐ No –Is design infiltration less than the SLA 3.0 equivalent? (Yes requires mechanical ventilation)
- 2b1 ☐ Yes ☐ No –Is mechanical ventilation installed? (No indicates failure to achieve compliance if 2b is Yes)
- 2c. ☐ Yes ☐ No –Is measured infiltration less than minimum (1.5 SLA)?
- 2c1 ☐ Yes ☐ No –Is mechanical ventilation installed to assure house pressure does not go below minus 5 Pascal relative to outside ambient with all exhaust fans operating (No indicates failure to achieve compliance if 2c is Yes)?
3. ☐ Yes ☐ No –This certifies that the building infiltration was verified (rater has verified Yes for items 1 and 2a and has responded to 2b, 2b1, 2c and 2c1). By checking Yes, rater is certifying that house passes infiltration reduction requirements.

When compliance credit is claimed for building infiltration reduction below default assumptions, builder employees or subcontractors shall certify that they have verified that the building infiltration level matches that used for compliance on the CF-1R and shall document the infiltration levels required for compliance and the tested infiltration values on the CF-6R. The rater shall indicate failure to achieve compliance with infiltration reduction requirements if the builder has not provided this documentation.

Mechanical Ventilation (fill in table if 2b1 or 2c1 are Yes)

	Needed for Compliance (from CF-1R)	Installed by Builder (From CF-6R)	Actual as determined by Rater
Continuous Mechanical Ventilation (CFM) ²			
Continuous Mechanical Supply Ventilation (CFM) Required to maintain -5 Pa if building envelope leakage is less than Minimum (Put NA in this row if 2c is No)			
Total Power Input Power of Continuous Mechanical Ventilation (Watts) ³			

4. ☐ Yes ☐ No –Is Actual mechanical ventilation equal to, or greater than, needed for Compliance? (No indicates failure to comply)
5. ☐ Yes ☐ No –Is Actual mechanical supply ventilation equal to, or greater than, needed for Compliance? (No indicates failure to comply. Check Yes if NA is used on this row in the above table.)
6. ☐ Yes ☐ No –Is Actual Total Input Power less than or equal to that needed for compliance? (No indicates failure to comply.)

HERS Rater

Name: _____	Firm: _____
Street Address: _____	City/State/Zip: _____
Telephone: _____	HERS Provider: _____
Signature _____	Telephone: _____
Date _____	

² When mechanical ventilation is required, CFM less than 0.047 CFM per square foot of conditioned floor area indicates failure to achieve compliance.

³ As determined from label on fan or manufacturers literature.

Project Title	Plan Number	Date
Sample Group Number	Sample House Number	

Copies to: Builder
 HERS Provider

The following is an explanation of many of the input values required on the Diagnostic portion of this form:

TYPE OF CREDIT

Refer to *Residential Manual* Chapters 4 and 5 for more details:

All:	If the HERS Rater determines that any features that are used for determining compliance on the CF-1R are designated <i>HERS Required Verification</i> they must appear on the CF-6R and also must be documented on this CF-4R as meeting the claims made in the CF-1R. If this does not occur, the HERS Rater shall not certify that the building complies and shall not sign the CF-4R. When testing for individual buildings, any failures should be reported back to the builder for correction. When testing as part of a sample of buildings, the failure to comply must be documented as described in Chapter 4.
Reduced Duct Surface Area:	Calculated as the outside area of the duct. Areas must be measured and verified by a HERS rater
Improved Duct Location:	Supply duct located in other than attic, as verified by location of registers (Requires HERS rater verification when used with reduced duct surface area or for ducts inside conditioned space)
Catastrophic Leakage:	Pressure pan test readings must be less than 1.5 Pascal at a house pressure of 25 Pascal.
TXV:	Access cover required to facilitate verification
Infiltration Reduction:	Infiltration is measured without mechanical ventilation operating. Mechanical ventilation is required for very tight house construction when credits for infiltration reduction using diagnostic testing are being used for achieving compliance. These very tight houses are defined as those with SLA of less than 1.5. The compliance documentation (CF-1R) will contain the measured CFM target value from a blower door test at 50 Pascal pressure difference that represents this SLA of 1.5. Mechanical ventilation is also required if the builder chooses to design the building to use mechanical ventilation and claims a credit for infiltration below an SLA of 3.0. The compliance documentation (CF-1R) will contain the measured CFM target value that represents this 3.0 SLA. If the builder claims credit in a design for infiltration reduction that is at an SLA of 3.0 or higher, and the actual measured SLA is 1.5 or greater, then mechanical ventilation is not required. If the SLA in this case were below 1.5, then mitigation (such as mechanical ventilation) would be required.

Site Address

Permit Number

An installation certificate is required to be posted at the building site or made available for all appropriate inspections. (The information provided on this form is required; however, use of this form to provide the information is optional.) After completion of final inspection, a copy must be provided to the building department (upon request) and the building owner at occupancy, per Section 10-103(b).

HVAC SYSTEMS:

Heating Equipment

Equip. Type (pkg. heat pump)	CEC Certified Mfr Name and Model Number	# of Identical Systems	Efficiency (AFUE, etc.) ¹ [≥CF-1R value]	Duct Location (attic, etc.)	Duct or Piping R-value	Heating Load (Btu/hr)	Heating Capacity (Btu/hr)

Cooling Equipment

Equip. Type (pkg. heat pump)	CEC Certified Compressor Unit Mfr Name and Model Number	# of Identical Systems	Efficiency (SEER, etc.) ¹ [≥CF-1R value]	Duct Location (attic, etc.)	Duct R-value	Cooling Load (Btu/hr)	Cooling Capacity (Btu/hr)

1. ≥ reads *greater than or equal to*.

I, the undersigned, verify that equipment listed above is: 1) the actual equipment installed, 2) equivalent to or more efficient than that specified in the certificate of compliance (Form CF-1R) submitted for compliance with the *Energy Efficiency Standards* for residential buildings, and 3) equipment that meets or exceeds the appropriate requirements for manufactured devices (from the *Appliance Efficiency Regulations* or Part 6), where applicable.

Signature, Date

Installing Subcontractor (Co. Name)
OR General Contractor (Co. Name) OR Owner

WATER HEATING SYSTEMS:

Heater Type	CEC Certified Mfr Name & Model Number	Distribution Type (Std. Point-of-Use)	If Recir- culation, Control Type	# of Identical Systems	Rated ² Input (kW or Btu/hr)	Tank Volume (gallons)	Effi- ciency ² (EF, RE)	Standby ² Loss (%)	External Insulation R-value ³

2 For **small gas storage** (rated input of less than or equal to 75,000 Btu/hr), **electric resistance** and **heat pump water heaters**, list Energy Factor.

For **large gas storage water heaters** (rated input of greater than 75,000 Btu/hr), list Recovery Efficiency, Standby Loss and Rated Input.

For **instantaneous gas water heaters**, list Recovery Efficiency and Rated Input.

3. R-12 external insulation is mandatory for storage water heaters with an energy factor of less than 0.58.

Faucets & Shower Heads:

All faucets and showerheads installed are certified to the Commission, pursuant to Title 24, Part 6, Section 111.

I, the undersigned, verify that equipment listed above my signature is: 1) the actual equipment installed; 2) equivalent to or more efficient than that specified in the certificate of compliance (Form CF-1R) submitted for compliance with the *Energy Efficiency Standards* for residential buildings; and 3) equipment that meets or exceeds the appropriate requirements for manufactured devices (from the *Appliance Efficiency Regulations* or Part 6), where applicable.

Signature, Date

Installing Subcontractor (Co. Name) OR
General Contractor (Co. Name) OR Owner

COPY TO: Building Department
HERS Provider (if applicable)
Building Owner at Occupancy

Site Address

Permit Number

FENESTRATION/GLAZING:

Manufacturer/Brand Name	Product U-Value ¹ (≤ CF-1R value) ²	Product SHGC ¹ (≤ CF-1R value) ²	# of Panes	Total Quantity of Like Product (Optional)	Square Feet	Interior or Exterior Shading Device or Overhang	Comments/Location/ Special Features
(GROUP LIKE PRODUCTS)							
1. _____	_____	_____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____	_____	_____
7. _____	_____	_____	_____	_____	_____	_____	_____
8. _____	_____	_____	_____	_____	_____	_____	_____
9. _____	_____	_____	_____	_____	_____	_____	_____
10. _____	_____	_____	_____	_____	_____	_____	_____
11. _____	_____	_____	_____	_____	_____	_____	_____
12. _____	_____	_____	_____	_____	_____	_____	_____
13. _____	_____	_____	_____	_____	_____	_____	_____
14. _____	_____	_____	_____	_____	_____	_____	_____
15. _____	_____	_____	_____	_____	_____	_____	_____

¹ Manufactured fenestration products use the values from the product label. Field fabricated fenestration products use the default values from Section 116 of the Energy Efficiency Standards.

² Installed U-value must be less than or equal to values from CF-1R. Installed SHGC must be less than or equal to values from CF-1R, or a shading device (interior, exterior or overhang) is installed as specified on the CF-1R. Alternatively, installed weighted average U-values for the total fenestration area are less than or equal to values from CF-1R.

I, the undersigned, verify that the fenestration/glazing listed above my signature: 1) is the actual fenestration product installed; 2) is equivalent to or has a lower U-Value and lower SHGC than that specified in the certificate of compliance (Form CF-1R) submitted for compliance with the *Energy Efficiency Standards* for residential buildings; and 3) the product meets or exceeds the appropriate requirements for manufactured devices (from Part 6), where applicable.

Item #s (if applicable)	Signature, Date	Installing Subcontractor (Co. Name) OR General Contractor (Co. Name) OR Owner OR Window Distributor
Item #s (if applicable)	Signature, Date	Installing Subcontractor (Co. Name) OR General Contractor (Co. Name) OR Owner OR Window Distributor
Item #s (if applicable)	Signature, Date	Installing Subcontractor (Co. Name) OR General Contractor (Co. Name) OR Owner OR Window Distributor

COPY TO: Building Department
HERS Provider (if applicable)
Building Owner at Occupancy

Site Address

Permit Number

DUCT DIAGNOSTICS

This building obtained compliance credit for:

- ☐ Duct sealing ☐ Duct Area Reduction
☐ ACCA Manual D design and installation

CREDIT FOR REDUCED DUCT SURFACE AREA OR LOCATION

Duct Location*

Exterior Surface Area (Cf-1R) Measured Exterior Surface Area

- ☐ Attic
☐ Crawlspace
☐ Basement
☐ Other _____

*Ignore ducts in conditioned space. Only a check is required for location credit.

ACCA Design

- ☐ Duct Design on Plans
☐ Installed duct diameters match plans

- ☐ TXV installed
☐ Access to TXV valve (if installed)
☐ No TXV, Fan air flow (CFM) _____

Duct Sealing

- ☐ Duct Leakage Measured
☐ Measured leakage (CFM) _____
 HVAC Fan air flow (CFM) _____ (measured or calculated as
☐ $CFM = 0.7 \times A_{\text{floor}}$ for CZ 8 through 15
☐ $CFM = 0.5 \times A_{\text{floor}}$ for CZ 1 through 7 & 16
 or, if the equipment size is known, the larger of 1 or 2.
 1. ☐ $CFM = 400 \times \text{Cooling Capacity in Tons}$ or
 2. ☐ $CFM = 21.7 \times \text{Heating Capacity in Thousands of Btu per hour}$
 Leakage divided by HVAC Fan air flow _____ (must be ≤ 0.06)

For AEROSOL TYPE SEALANTS ONLY - The following diagnostic testing was completed:

- ☐ Duct Fan Pressurization at rough-in measured leakage CFM) _____ CHECK AFTER FINISHING WALL::
☐ Pressure pan test ☐ House pressurization test ☐ Visual Inspection of Duct Connections
 Provide Follow-up Test Results or Inspection Results on a Separate Page

- ☐ This certifies that the duct surface area and duct locations were verified.

When compliance credit is claimed for duct surface area reductions and duct location improvements beyond those covered by default assumptions, builder employees or subcontractors shall certify that they have verified that the duct surface area and locations match those on the plans and shall indicate the duct surface area in each duct location on the CF-6R.

- ☐ This is to certify that the above diagnostic test results and the work I performed associated with the test(s) is in conformance with the requirements for compliance credit. [The builder shall provide the HERS provider a copy of the CF-6R signed by the builder employees or sub-contractors certifying that diagnostic testing and installation meet the requirements for compliance credit.]

Tests

Performed

COPY TO:

Building Department
 HERS Provider (if applicable)
 Building Owner at Occupancy

Signature, Date

Installing Subcontractor (Co. Name) OR
 General Contractor (Co. Name)

Site Address

Permit Number

BUILDING ENVELOPE LEAKAGE DIAGNOSTICS

This building obtained compliance credit for: ☐ Envelope sealing using diagnostic testing (CF-1R)

Diagnostic Testing Results

	Needed for Compliance (from CF- 1R)	Measured Blowerdoor Test Results
Building Envelope Leakage (CFM @ 50 Pa)		
Leakage level equivalent to an SLA of 3.0 from CF-1R		
Minimum Building Leakage equivalent to an SLA of 1.5 from CF-1R (CFM @ 50 Pa)		

- ☐ Yes ☐ No Is design leakage less than the SLA 3.0 equivalent (from CF-1R)?
- ☐ Yes ☐ No Is mechanical ventilation installed? (Required if design is less than 3.0 SLA)
- ☐ Yes ☐ No Is measured leakage (without fans operating) less than minimum in the above Table (1.5 SLA from CF-1R)?
- ☐ Yes ☐ No Is mechanical supply ventilation installed to assure house pressure does not go below minus 5 Pascal relative to outside ambient with all exhaust fans operating?

Mechanical Ventilation – Fill in Table if mechanical ventilation is installed

	Used for Compliance (from CF-1R)	Measured Actual
Continuous Mechanical Ventilation (CFM) ¹		
Continuous Mechanical Supply Ventilation (CFM) Required to maintain -5 Pa if building envelope leakage is less than minimum (see above)		
Total Power Consumption of Continuous Mechanical Ventilation (Watts) ²		

- ☐ This certifies that the building envelope leakage was verified.
When compliance credit is claimed for building leakage reduction below default assumptions, builder employees or subcontractors shall certify that they have verified that the building leakage level matches that used for compliance on the CF-1R and shall document the leakage levels required for compliance and the tested infiltration values on the CF-6R.
- ☐ This is to certify that the above diagnostic test results and the work I performed associated with the test(s) is in conformance with the requirements for compliance credit. [The builder shall provide the HERS provider a copy of the CF-6R signed by the builder employees or sub-contractors certifying that diagnostic testing and installation meet the requirements for compliance credit.]

Test Performed	Signature	Date	Testing Subcontractor (Co. Name) OR General Contractor (Co. Name)
----------------	-----------	------	--

COPY TO: Building Department
HERS Provider (if applicable)

¹ When mechanical ventilation is required, CFM less than 0.047 CFM per square foot of conditioned floor area indicates failure to achieve compliance.

² As determined from label on fan or manufacturers literature.

Site Address

Permit Number

The following is an explanation of many of the input values required on this form:

HVAC SYSTEMS

Heating Equipment Type must be one of the following:

Furnace:	Gas (including Liquefied Petroleum Gases) or oil-fired central furnace & space heater
Boiler:	Gas or oil-fired boiler
PckgHeatPump:	Packaged central heat pump
SplitHeatPump:	Split central heat pump
RoomHeatPump:	Room heat pump
LgPkgHeatPump:	Large packaged heat pump ($\geq 65,000$ Btu/hr output)
Electric:	Electric resistance heating (fixed HSPF = 3.413); radiant electric resistance (fixed HSPF = 3.55)
CombinedHydro:	Reference water heater under water heating systems below

CEC Certified Manufacturer Name & Model Number from applicable Commission approved appliance directory.

of Identical Systems is for those systems with the same efficiency, duct location, duct R-value and capacity.

Efficiency from applicable Commission certified appliance directory.

Duct (or Piping) Location is attic, crawl space, CVC crawl space, conditioned space, unconditioned space or none.

Duct (or Piping) R-Value from Directory of Certified Insulation Materials and/or manufacturer's data.

Heating/Cooling Load refer to Commission approved load calculation procedure.

Heating/Cooling Capacity from the applicable Commission certified appliance directory. Note: location elevations over 2,000 ft above sea level require a derating of output capacity (refer to manufacturer's literature).

Cooling Equipment Type must be one of the following:

SplitAirCond:	Split system air conditioner
PckgAirCond:	Packaged air conditioner
Split Heat Pump:	Split system heat pump
PckgHeatPump:	Packaged heat pump
RoomHeatPump:	Room heat pump
LgPkgHeatPump:	Large packaged heat pump ($\geq 65,000$ Btu/hr output). Substitute EER for SEER when SEER is not available
RoomAirCond:	Room air conditioner. Minimum SEER varies*
LgPkgAirCond:	Large packaged air conditioner ($\geq 65,000$ Btu/hr output). Substitute EER for SEER when SEER is not available
EvapDirect:	Direct evaporative cooling system. For compliance calculation purposes, fixed values: SEER = 11.0; duct location = attic; duct insulation R-value = 4.2
EvapIndirect:	Indirect evaporative cooling system. For compliance calculation purposes, fixed values: SEER = 13.0; duct location = attic; duct insulation R-value = 4.2

*Refer to Energy Commission publication *Appliance Efficiency Regulations*, P400-92-029

Site Address

Permit Number

The following is an explanation of many of the input values required on this form:

WATER HEATING SYSTEMS

Distribution Systems Refer to *Residential Manual* for more details:

Standard:	Standard – Supply pressure based system, no pumps
Pipe Insulation:	Pipe Insulation on all 3/4-inch pipes
POU/HWR:	Point of Use/Hot Water Recovery System
Recirc/NoControl:	Recirculation loop with no controls
Recirc/Timer:	Recirculation loop with a timer
Recirc/Temp:	Recirculation loop with temperature control
Recirc/Time+Temp:	Recirculation loop with a timer and temperature control
Recirc/Demand:	Recirculation loop with demand control

Water Heater Type

	Information Needed			
	<u>Energy Factor</u>	<u>Recovery Efficiency</u>	<u>Standby Loss</u>	<u>Rated Input</u>
Storage Gas, Oil or Electric	Yes	No	No	No
Heat Pump	Yes	No	No	No
Instantaneous Gas	No	Yes	No	No
Instantaneous Electric	Yes	No	No	No
Large Storage Gas	No	Yes	Yes	Yes
Indirect Gas (Boiler)	No	Yes (AFUE)	No	Yes

FENESTRATION/GLAZING

Fenestration:	Windows, sliding glass doors, French doors, skylights, garden windows, and any door with more than one square foot of glass
Operator Type:	Slider, hinged, fixed
U-Value:	<p>Installed U-value must be less than or equal to value from CF-1R</p> <p>OR</p> <p>Installed weighted average U-value for the total fenestration area is less than or equal to value from CF-1R</p>
SHGC:	<p>Installed SHGC must be less than or equal to value from CF-1R</p> <p>OR</p> <p>Installed weighted SHGC for the total fenestration area is less than or equal to value from CF-1R</p> <p>OR</p> <p>An interior shading device, overhang, or exterior shading device is installed consistent with the CF-1R</p>
Shading Device:	Include when the building complied using an <i>interior</i> shading device: blinds, opaque roller shades, blinds (do not list draperies), an <i>exterior</i> shading device: woven sunscreen, louvered sunscreen, low sun angle sunscreen, roll-down awning, roll-down blinds or slats (do not list bug screen), or an overhang (include depth in feet)

Site Address

Permit Number

The following is an explanation of many of the input values required on the Diagnostic portion of this form (page 3 of 6):

TYPE OF CREDIT

Refer to *Residential Manual* Chapters 4 and 5 for more details:

Reduced Duct Surface Area:	Calculated as the outside area of the duct. Areas must be measured and verified by a HERS rater.
Improved Duct Location:	Supply duct located in other than attic, as verified by location of registers (does not require HERS rater verification).
Catastrophic Leakage:	Pressure pan test readings must be less than 1.5 Pascal at a house pressure of 25 Pascal.
TXV:	Access cover required to facilitate verification.
Infiltration Reduction:	Infiltration is measured without mechanical ventilation operating. Mechanical ventilation is required for very tight house construction when credits for infiltration reduction using diagnostic testing are being used for achieving compliance. These very tight houses are defined as those with SLA of less than 1.5. The compliance documentation (CF-1R) will contain the measured CFM target value from a blower door test at 50 Pascal pressure difference that represents this SLA of 1.5. Mechanical ventilation is also required if the builder chooses to design the building to use mechanical ventilation and claims a credit for infiltration below an SLA of 3.0. The compliance documentation (CF-1R) will contain the measured CFM target value that represents this 3.0 SLA. If the builder claims credit in a design for infiltration reduction that is at an SLA of 3.0 or higher, and the actual measured SLA is 1.5 or greater, then mechanical ventilation is not required. If the SLA in this case were below 1.5, then mitigation (such as mechanical ventilation) would be required.

INSULATION CERTIFICATE

IC-1

Number and Street _____		City _____
County _____	Subdivision _____	Lot Number _____

Description of Installation

1. ROOF
Material _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____
2. CEILING
Batt or Blanket Type _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____
Loose Fill Type _____ Brand _____
Contractor's min installed weight/ft² _____ lb Minimum thickness _____ inches
Manufacturer's installed weight per square foot to achieve Thermal Resistance (R-Value) _____
3. EXTERIOR WALL
Frame Type _____
A. Cavity Insulation
Material _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____
B. Exterior Foam Sheathing
Material _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____
4. RAISED FLOOR
Material _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____
5. SLAB FLOOR/PERIMETER
Material _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____
Perimeter Insulation Depth (inches) _____
6. FOUNDATION WALL
Material _____ Brand Name _____
Thickness (inches) _____ Thermal Resistance (R-Value) _____

Declaration

I hereby certify that the above insulation was installed in the building at the above location in conformance with the current *Energy Efficiency Standards* for residential buildings (Title 24, Part 6, California Code of Regulations) as indicated on the Certificate of Compliance, where applicable.

Item #s _____	Signature, Date _____	Installing Subcontractor (Co. Name) OR General Contractor (Co. Name) OR Owner _____
Item #s _____	Signature, Date _____	Installing Subcontractor (Co. Name) OR General Contractor (Co. Name) OR Owner _____
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